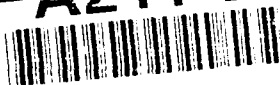


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RESEARCH REPORT

COST EFFECTIVENESS COMPARISON:

B-2 VERSUS THE CRUISE MISSILE

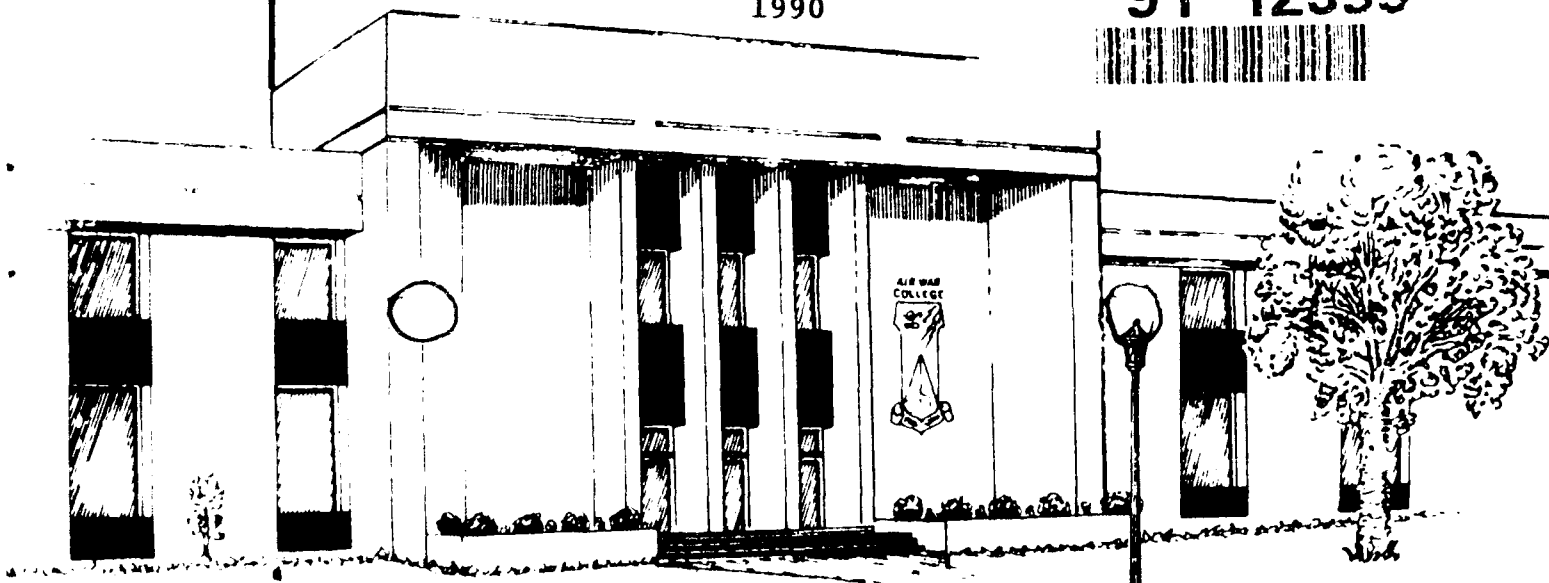
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AIR UNIVERSITY
UNITED STATES AIR FORCE
MAXWELL AIR FORCE BASE, ALABAMA

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COST EFFECTIVENESS COMPARISON:

B-2 VERSUS THE CRUISE MISSILE

by

Lewis V. Evans, Lt Col, USAF

and

Frank L. Griffin, Lt Col, USAF

A DEFENSE ANALYTICAL STUDY SUBMITTED TO THE FACULTY

IN

FULFILLMENT OF THE CURRICULUM

REQUIREMENT

Advisor: Colonel Randall E. Wooten

MAXWELL AIR FORCE BASE, ALABAMA

16 April 1990

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EXECUTIVE SUMMARY

TITLE: Cost Effectiveness Comparison: B-2 Versus the Cruise Missile.

AUTHORS: Vince Evans, Lt Col, USAF and Frank Griffin, Lt Col, USAF.

The purpose of this essay is twofold: first, provide a single source, unclassified document on the issues surrounding the ~~B-2~~; second, provide an unbiased comparison of the cost effectiveness of the ~~B-2~~ and the Cruise missile. This paper deals with the issues and controversy that surrounds the procurement of the ~~B-2~~. These issues include the possible use of cruise missiles and a new cruise missile carrier aircraft as an alternative to the B-2. Most of the controversy over the B-2 is directly linked to a sticker price of approximately \$540 million per aircraft. This price tag includes all the costs associated with research and development (R&D) to include stealth technology. In the authors' opinion, this price tag is not a valid measure for two reasons. One, much of the aircraft's research and development (stealth technology) is a sunk cost and will apply to other projects. Second, the USAF does not traditionally include R&D costs into the unit fly-away cost figure for the aircraft we procure. In this paper the capabilities and costs associated with a

possible cruise missile option are examined and contrasted with the B-2 program and the unique capabilities that the B-2 era of technology will provide the U.S.

IN PEACE PREPARE FOR WAR, IN WAR PREPARE FOR PEACE. THE ART OF WAR IS OF VITAL IMPORTANCE TO THE STATE. IT IS A MATTER OF LIFE AND DEATH, A ROAD EITHER TO SAFETY OR TO RUIN. HENCE UNDER NO CIRCUMSTANCES CAN IT BE NEGLECTED.....

SUN TSU

INTRODUCTION

Without a doubt, the B-2 has been one of the most emotional and controversial issues in the Department of Defense. Despite the B-2s revolutionary technology and its unique capabilities that will strengthen our nations nuclear and conventional force structure, the critics say:

"There are radars that may detect the B-2"

"Its mission can be performed by alternate systems."

"The country doesn't need another bomber"

But the unanimous and deafening cry is **"It costs too much!"**

Granted, if one looks only at the dollar amount, without understanding the threat to our national security and national interests and the requirements to guarantee the American way of life, the sticker price may seem high. There are many who have jumped on the *"It costs too much"* band wagon. But have they jumped on that "cart" without understanding all the factors that go into determining cost effectiveness? As the Secretary of Defense said "...the cry of "sticker shock" is a phony argument. The opponents of the B-2 do not plan to return the unspent money to the taxpayers. They plan to spend it on other projects. So the real issue is not cost, but whether the B-2 is worth more

than the pork barrel."¹ In order to fully understand the need for the the B-2 or an alternative, one needs to understand the multifaceted strategic systems used to deter attacks against the United States.

TRIAD/SIOP

The United States currently supports the TRIAD concept of nuclear capability and deterrence. The TRIAD's core is the combination of land based intercontinental ballistic missiles (ICBM's), sea launched ballistic missiles (SLBMs) and manned bombers. This doctrine or policy has repeatedly passed the tests of critical evaluations as different administrations looked at the changes to the nuclear policy either due to politics, technology or fiscal constraints. Since the end of World War II (WWII), U.S. political and military leaders have agreed that a strong nuclear deterrent is the best defense for the U.S. and her NATO allies. The validity of this doctrine has been proven by the longest stretch of peace in recent European history. Thus, for the past thirty years, the TRIAD has been the foundation of our national deterrent strategy.

The concept of the TRIAD is based on the need to hold the target set (contained in the Single Integrated Operational Plan (SIOP)) at risk, and the ability to accomplish this mission in retaliation to a Soviet first strike. In addition,

¹ Air Force Policy Letter for Commanders, Washington D.C., October, 1989.

under the current policy of countervailing strategy, the U.S. must be capable of providing a response at the same level as the attack received. In other words, the National Command Authority would not want to be in the position of having to launch an all out ICBM attack if an enemy were to use only a tactical nuclear device. Conversely, the U.S. would not want to try and respond to an enemy ICBM launch with just our SLBM's, for they lack the range or the hard target kill capability to cover the priority target set. Therefore, the primary area of interest to those concerned about the deterrent role of the U.S. nuclear forces is the probability of success (Ps) of any individual weapon system or leg of the TRIAD. The Ps of the TRIAD or individual part of the TRIAD is based on its ability to react to an attack, its ability to arrive at a designated target, and its ability to destroy its target when it strikes. Each leg of the TRIAD has advantages in survivability, weapons effectiveness, and cost that make the concept of the TRIAD stand up to the most critical evaluation. Clearly, the TRIAD is a capable and cost effective force mix that provides full spectrum deterrence.²

The air breathing leg of the TRIAD has been a critical part of our deterrent posture.³ Our nation depends on the bomber leg for delivery of more than 40 percent of

² HQ SAC Issue Paper, date and originator unknown.

³ George J. Seiler, "Strategic Nuclear Force Requirements and Issues", Air University Press, Feb 1983, Pg.104.

deterrent weapons.⁴ Of the three legs of the TRIAD--ICBMs, SLBMs, Bombers--the manned bomber provides accuracy, flexibility, and perhaps more importantly, can be recalled and recovered for use in follow-on sorties. In order to comprehend the need for a manned bomber, one must understand that bombers do not function solely as nuclear weapon carriers. According to General John Chain, (CINCSAC), today, manned bombers have significant non-nuclear responsibilities.⁵ In light of the growing incidence and intensity of regional conflicts and the increase in world wide terrorist activity, these responsibilities are increasing. This is further exacerbated by the constraints on the U.S. military budget, which places a premium on weapon systems versatility and the need to derive maximum capability from U.S. forces.⁶

To further investigate the necessity of the TRIAD, especially as it relates to the question of the manned penetrating B-2 versus the stand-off cruise missile, one must examine the arguments that continue to be used by those who support the B-2. "The continued case for high-performance penetrating bombers seems to hinge on four main arguments: (1) the combination of bombers and air launched cruise missiles (ALCMs) puts a great stress on air

⁴ Minutes from testimony to the U.S. Senate, Committee on Armed Services, 21 July, 1989, pg., 12.

⁵General John T. Chain, Jr, "Strategic Bombers In Conventional Warfare," Strategic Review, Spring 1988, pg.,23.

⁶Ibid., pg. 23-24.

defenses, thus providing maximum penetration for both (and causing continued heavy Soviet investment in air defenses); (2) bombers can find mobile targets or be redirected to secondary targets, whereas ALCMs cannot; (3) bombers continue to be needed for other missions (i.e., B-52s were used in Vietnam); and (4) because of insufficient range of ALCMs, in order to cover the target set bombers must penetrate some Soviet air defenses even to launch cruise missiles.⁷ With regard to the ability to strike relocatable targets, military officials have acknowledged on several occasions that the task of finding relocatable targets is a significant challenge. However, USAF Chief of Staff, General Larry Welch, contends that the B-2 "offers the best hope of holding at risk some portion of the growing Soviet relocatable target base."⁸ In defense of the ALCMs, technology certainly exists to extend the range of cruise missiles to allow their launch outside enemy air defenses. However, aircraft developed specifically for cruise missile launch roles would carry a large cruise missile payload. Thus they would be very lucrative targets for enemy interceptors. The argument for conventional bomber use in contingency operations is indeed a valid reason to keep some bombers in the force. However, the requirements for

⁷Sidney D. Drell and Thomas H. Johnson, "Managing Strategic Weapons," *Foreign Affairs*, vol 66, Summer '88, 1039.

⁸Robert R. Ropelewski, "USAF Backpeddling on B-2 Relocatable Target Mission", *Armed Forces Journal International*, July 1989, pg., 14.

these bombers may be different from those for a bomber force required to penetrate formidable air defenses during a nuclear war.⁹ Due to its unique design, the B-2 will allow the U.S. to meet its objectives, nuclear or conventional, day or night, high or low altitude.

B-2

DESCRIPTION

The B-2 is an unconventionally designed aircraft that takes its shape from early flying wing prototypes. The unconventional aspect is that it lacks the familiar vertical and horizontal stabilizers required by ordinary aircraft. These characteristics provide a lower profile and combined with stealth technology, produce an extremely low radar cross section that is invisible to most radars. Its aerodynamic design makes it extremely efficient, which translates into range. Longer range, combined with its low observable technology, allows the B-2 to hold a variety of strategic and tactical targets at risk. More importantly, the B-2's low observable design will allow it to penetrate and survive highly defended areas at either high or low altitudes. Remember, originally the B-52 was designed to fly in the high altitude sanctuary. The threat soon improved

⁹Sidney D. Drell and Thomas H. Johnson, "Managing Strategic Weapons," *Foreign Affairs*, vol 66, Summer '88, pg.,1039.

and the B-52 was forced to fly at 200 feet to get beneath the enemies radar network.¹⁰

In terms of detectability, the B-2's low radar cross section is due in part to the lack of vertical and horizontal stabilizers. A simple analogy can be made by comparing a conventional aircraft (the B-52) with a shark. Like the shark, the B-52 has a large tail fin which often telegraphs its presence, especially at low altitude. Imagine how much more ominous the shark would be if it did not have, or if you could not see, its vertical fin. Thus, the B-2's unconventional design (lack of vertical stabilizer) will make it less susceptible to enemy acquisition (radar and visual) and force the enemy to allocate resources in an attempt to counter this nearly [electronically] invisible weapon system regardless of its mission or mission profile.

ROLE/MISSION

The B-2s mission is to maintain the continued viability of our national strategy of deterrence.¹¹ The assured capability of the B-2 to penetrate enemy air defenses and destroy any target gives the USAF the means to support this strategy. As the Secretary of the Air Force, Donald Rice, indicated "...The prime mission of the B-2 has always been clear: The aircraft will provide enduring penetration capability for the nuclear bomber force so that it will be

¹⁰Arthur T. Hadley. "The Straw Giant.", Random House Inc., New York, 1986, pg., 210-11.

¹¹Hq SAC Background paper, date and originator unknown.

able to reach targets in the Soviet Union in the future, despite heavy Soviet investment in air defense fighters and SAMs. The bomber's role in the Single Integrated Operational Plan is paramount."¹²

With its low observable characteristics, the B-2 will out-pace the improvements in enemy air defense systems, thus providing a lasting and survivable penetration capability for the bomber leg of the TRIAD.¹³ Admittedly, the manned bomber may not be the only weapon system capable of penetrating enemy defenses to strike strategic targets. A possible alternative to the B-2/manned bomber is the cruise missile.

CRUISE MISSILE

BACKGROUND

The concept of a standoff launch and attack capability has been around almost since the beginning of flight. Wilbur Wright and Hap Arnold worked on an unmanned vehicle as early as World War I.¹⁴ The V-1 and V-2 bombs used by the Germans in World War II were early cruise missiles but were not very effective or survivable due to slow speed, short range, and guidance systems that allowed no maneuvering.¹⁵

¹²Robert s. Dudney. "The B-2 is Still Flying.", Air Force Magazine. September 1989, pg.,24.

¹³Hq SAC/XRYA Background Paper. 29 JUN 1989.

¹⁴George J. Seiler, "Strategic Nuclear Force Requirements and Issues", Air University Press, Feb 1983, Pg.136.

¹⁵Ibid., pg.,136.

The first air-to-ground cruise missiles became operational in the late 1950's when both Britain and the United States put missiles into service. The crews could select various flight profiles and targets, including high and low ingress altitudes. The lack of reliability of the early systems made them inadequate for our nuclear forces, but the concept was valid.¹⁶

The current ALCM, (AGM-86B) flies the same type profiles as a B-52 would fly, which complicates the air defense problem. Three breakthroughs in technology allow for today's very effective ALCMs. Jet engine technology has produced very capable, small, fuel efficient engines. Advances in warhead design have greatly reduced their weight and improvements in inertial navigation technology have provided much better terrain contour profiles to enhance missile survivability.¹⁷

The Air Force is currently developing the Advanced Cruise Missile (ACM), which will be much more accurate and have greater range than the current ALCM; thus increasing launch aircraft survivability and expanding the reachable target set. The increased range will also allow the cruise missile to circumnavigate more threats, thus increasing probability of arrival at the target. There is an increased use of low observable technology in the development of the ACM, which will enhance the missile's ability to penetrate

¹⁶Ibid., pg.,136.

¹⁷Ibid., pg.,137.

highly defended areas.¹⁸ This increase in cruise missile capability would allow more flexibility in the requirement for a cruise missile carrier .

CRUISE MISSILE CARRIER Aircraft (CMCA)

Examination of the alternative of using the cruise missile instead of a penetrating bomber to strike targets not allocated to ballistic missiles, reveals that an all stand-off force would require a new aircraft to act as a cruise missile carrier.

The USAF has modified B-52's to carry ALCMs. As of this writing, the USAF has the following B-52 ALCM capable aircraft, each of which can carry 12 externally mounted ALCMs:¹⁹

	<u>B-52G</u>	<u>B-52H</u>
<u>PAA</u>	83	84
<u>IAI</u>	91	95

A rotary launcher (CSRL) has been designed which will allow some B-52H models to internally carry eight additional ALCMs.

The USAF plans to use the B-1 as a replacement for the aging B-52 if the B-2 is procured. If a decision is made to scrap the B-2 production, and increase the cruise missile buy to cover the B-2's strike capability, the Air Force will need to

¹⁸FY 90 Annual Report to Congress, pg., 189.

¹⁹HQ USAF/PRPFS, 12 February 1990.

procure an airplane to supplement current ALCM carriage capability. The new aircraft might be capable of a back up role, but the problem faced with its use in a back up role would be the same as that faced when trying to take B 52s out of the SIOP and dedicate them to conventional missions. The problem--component commander concern that the B-52 would not be released from the SIOP role if/ when required for other missions.

The USAF has had contracts with several different aircraft companies to investigate the feasibility of modifying off-the-shelf transport aircraft for use as cruise missile carriers. This included the Boeing 707, 747, the C-141, C-5 and L-1011 and DC-10.²⁰

As an example that may shed some light on the cost of a cruise missile alternative, assume that the U.S. decided to purchase a CMCA. For purposes of this illustration, assume a selection of the Boeing 747 for the CMCA. Based on the 1987-88 Boeing sales price, the average cost of these aircraft, without modifications, would be \$135 million each. Additionally, the aircraft would require some changes to make it compatible with the cruise missile.²¹

There are some advantages in using these aircraft, primarily in ease of production and cost. They would be easy and quick to procure, but would present problems in

²⁰Kenneth P. Werrell, *Evolution of the Cruise Missile*, Air University Press, Sep 1985, pg., 188.

²¹HQ SAC/XRYA Background Paper, January 1990.

terms of survivability until they were modified. The concept of using transport type aircraft does not lend itself to the Air Force's desire to have a launch aircraft with good escape characteristics, nuclear hardening, offensive and defensive avionics, long range and heavy payloads.²² In addition, the concept of using as wide body aircraft to carry between 48 and 90 cruise missiles, yields such a lucrative target that one might expect the enemy to put forth a great deal of effort to destroy it before it reached its launch point.²³

Effectiveness

The manned bomber can cover approximately 60 percent of the SIOP targets. In addition to its versatility, the B-2 combines accuracy and selectable weapon yields which makes it very effective against hardened targets.²⁴

Pre-launch survival and escape parameters would be about the same for a modified cruise missile carrying aircraft as for any bomber. If one used a plane such as an unmodified 747 instead of a B-52, or B-1, the chance of survival would be somewhat less due to the 747 not being hardened against blast and electro-magnetic pulse (EMP). In the case of a pure CMCA with the larger number of warheads on board, the possibility of losing so many weapons during the start, taxi,

²²Kenneth P. Werrell, *Evolution of the Cruise Missile*, Air University Press, Sep 1985, pg., 188.

²³*Ibid.*, pg., 189.

²⁴Robert S. Dudney. "The B-2 is Still Flying." Air Force Magazine. September 1989. pg. 24.

take-off and base escape phases would degrade any war fighting ability to a large extent.²⁵

"According to one study, if taken in total-- post-launch reliability, vulnerability of the CMCA, probability of base escape, reliability of the carrier, and the actual attrition rate of the missiles enroute to the target--50 to 80 percent would be lost."²⁶ This is a very pessimistic evaluation, but even the most ardent stand-off supporter would have to question any claim to invulnerability of the cruise missile.²⁷

The B-2 however, must also be examined in its claims of low detectability and high survivability. The B-2 stealth capability may be limited to shorter wave length radars due to restrictions on the thickness of composites to be used. This means that modern radars might have trouble finding the B-2, but the B-2 may have little effect on a host of older long-wave radars that are still operational.²⁸ Because the B-2s true stealth capability remains classified and untested, this may be an erroneous statement. However, when cost and the reliance on stealth technology are discussed, it cannot be dismissed. In addition to the capabilities of the cruise missile, a complete evaluation of the B-2/cruise missile argument must include an

²⁵ George J. Seiler, "Strategic Nuclear Force Requirements and Issues" Air University Press, February 1983. pg., 139.

²⁶ Ibid., pg., 140.

²⁷ Ibid., pg., 140.

²⁸ International Defense Review. August 1989. pg.1013.

examination of the issues contained in the proposed strategic arms limitation discussions.

STRATEGIC ARMS REDUCTIONS TALKS (START)

The purpose of START is to reach agreement on the reduction of strategic nuclear weapons held by the U. S. and the Soviets. The current proposal limits both sides to a maximum of 6,000 weapons.²⁹ Of this, 4,900 can be deployed ICBMs and SLCMs, the remaining can be bomber weapons.³⁰ The proposal also stipulates that each non-cruise missile bomber will count as one weapon against the 6000 limit regardless of what is carried internally in terms of gravity bombs and short range nuclear missiles.³¹

It is important to note, that even though START limits each nation to 6,000 warheads, this in itself gives the Soviets a significant advantage. According to General Jack Chain, "...I have more targets to hold at risk in the Soviet Union than they have to hold at risk in the United States. So, 6,000 equally on both sides is interesting. But they end up with a net advantage, even at the 6,000 level."³²

This means that an agreement based on both sides current negotiating positions would structure a U.S. nuclear force with bombers carrying over 50 percent of all our weapons. Penetrating bombers alone would carry more than 33

²⁹ Testimony to U.S. Senate, Committee on Armed Services, 21 July 1989, pg., 27.

³⁰ Ibid., pg., 27.

³¹ Ibid., pg., 27.

³² Ibid., pg., 27.

percent of our nuclear weapons. This increased reliance on penetrating bombers because of the Reykjavik counting rule emphasizes the conviction on both sides that the bombers are the most stabilizing of all nuclear weapons systems.³³

COST DATA

B-2 COST³⁴

There are many methods that have been used to compute B-2 cost. In order to give the reader a comparison from which to make a fair judgment, three of the most common methods will be compared in detail.

Total Program cost Method: This method is not normally used in aircraft procurement because it includes the cost of research and development (R&D), simulators, initial spares, support equipment and military construction (MILCON). Many times, research completed for one program can help offset development costs on other programs. The estimated total B-2 program cost, for 132 aircraft in then year (TY\$) dollars, is \$70.2 billion.³⁵ This equates to a cost of approximately \$532 million per aircraft.

Production cost method: This method excludes R&D costs and full scale development (FSD) costs. These costs are excluded because they represent a sunk cost which is spent whether or not the aircraft is produced. The cost for

33 HQ SAC B-2 Briefing, Sep 21, 1989.

34 Note: This info taken from HQ SAC/XRYA Bkgnd Paper, dated 18 Jan 1990.

35 Ibid., pg., 3.

R&D/FSD for the first five aircraft is approximately \$43.8 billion in (FY81\$) dollars.³⁶ This equates to a production cost for the remaining 127 aircraft of approximately \$345 million per aircraft in TY dollars. Of the \$43.8 billion, approximately 33% (\$15 billion) represents development costs and approximately 70% of that figure has already been obligated by the Air Force.

Unit fly away cost method: The following chart shows a B-1/B-2 unit flyaway cost comparison: (NOTE: COSTS IN MILLIONS OF DOLLARS)

	<u>FY81\$*</u>	<u>FY89\$</u>	<u># AIRCRAFT</u>
B-1	149.4	226.4	100
B-2	181	274	127

*FY81 was used as the base year for both aircraft to avoid comparison in constant dollars, which would require adding inflation to the B-1 costs.

Design differences between the two aircraft do not permit a true unit flyaway cost comparison. However, design differences aside, unit flyaway cost is probably the most accurate method of comparison since R&D, simulators, spares and MILCON costs are excluded.

CRUISE MISSILE ALTERNATIVE COSTS

The discussion of a cruise missile alternative is not based on an official plan and thus, the numbers of missiles

³⁶ Ibid., pg., 3.

and launch aircraft are estimates of what would logically be required to accomplish the mission or fill the void created by not procuring the B-2. For example, the planned B-2 fleet would be capable of delivering 2000 weapons. Therefore, in order to hold the same number of targets at risk, a cruise missile alternative would need to be based on a buy of 2000 ACMs.

The latest cost estimate for the ACM is \$3.5 million per copy and the missile has a 15 year life cycle. That means, that the initial buy of 2000 missiles would cost \$7 billion and would have to be replaced in 15 years in order to be compared to the B-2, which would realistically have a 30 year life cycle. Using historical inflation figures, the purchase price for the second buy of 2000 ACMs would conservatively be approximately \$12 billion. Thus, the 30 year cost for the cruise missiles alone would be a minimum of \$19 billion.³⁷

In order to make a fair comparison of the B-2 and cruise missile alternative, we need to discuss the procurement of a CMCA. As discussed earlier, a likely candidate for a carrier aircraft might be a commercial model of the Boeing 747. A conservative cost estimate for this aircraft has been stated as approximately \$135 million per copy. Since there is no official plan to procure a CMCA, our study does not have a basis for the number of CMCA required. A

³⁷ Info provided by HQ USAF/PRPFP, Mar 1990.

conservative estimate would be 66 or one-half of the planned procurement of B-2s. The cost of these 66 aircraft would be \$8.9 billion and this does not include the cost required to militarize (avionics, ACM integration, etc.) the aircraft.³⁸ Another option would be to procure the same number of CMCA as the planned B-2 buy, increasing the CMCA cost to \$17.8 billion. In order to provide a realistic and credible threat, it is imperative that the carrier aircraft be nuclear hardened and configured with some type of defensive equipment. We have no cost estimate for such modification, however, research on other weapon systems shows that a 10 percent cost for avionics would not be unrealistic. This would mean adding up to \$1.8 billion to the CMCA buy, which could bring the total to as much as \$19.6 billion for the aircraft and \$19 billion for the cruise missiles or a total of \$38.6 billion versus \$40 billion for the B-2 buy.³⁹ Although these notional cruise missile alternatives could both save money, the U.S. would be left with a weapon system that is: less survivable, less reliable, and without any of the inherent capabilities of the B-2. These capabilities include the ability to: penetrate defenses, be recalled, strike alternate targets and also be used on conventional and other types of missions.

CONCLUSION

³⁸ Ibid.

³⁹ Ibid.

One must look at the B-2 for its value across the entire spectrum of conflict--nuclear and non-nuclear. Not only is the B-2 critical to the U.S.'s technological base, it also represents an investment in our capability to defend our national values.⁴⁰ The most vocal criticism of the B-2 appears to be its cost. However, dollar amount can not be the sole criterion one looks at in determining the fate of this program. Rather, look at the price tag in terms of how much it will cost an enemy to defend against the B-2 and its inherent capabilities.

Thus far, approximately \$23 billion has been spent on B-2 research and development and military construction (facilities). B-2 cancellation would represent a huge loss in investment capital and perhaps a bigger loss in terms of investment in our national capabilities.

For those who argue that the Cruise Missile is a suitable alternative to the B-2, consider the following:

- the total cost of the ACM and a CMCA could total approximately \$40 billion--the same as the B-2 but without the inherent flexibility of a manned penetrator
- cruise missiles lack the flexibility to attack a wide range of targets (area/relocatable)
- cruise missiles cannot react to enemy defenses
- it would require a substantial increase in cruise

⁴⁰ Donald E. Fink, *Aviation Week & Space Technology*, July 24, 1989, pg., 13.

missile warheads (which the current START negotiations constrain) in order to hold the B-2 target set at risk

- the cruise missile delivery platform represents a lucrative and perhaps easily targeted, target for enemy defensive systems

Granted, the B-2 is costly; however it represents an investment in a force structure that will provide an effective strategic deterrent. As General Welch stated "The question is: Do we invest the remaining funds required to field the aircraft now that the great majority of the development effort is completed?...While we should not proceed on the basis of a sunk-cost argument, the program must be viewed from the perspective of cost-to-go to field 132 aircraft. The flip side of the cost argument is the cost to this nation of not going forward if that decision leads to failure of strategic deterrence."⁴¹

Still, many question the value of such an aircraft regardless of its technological superiority or its contribution to force modernization.⁴² As Secretary Rice said, "When we get away from the focus on the grand total, with all the inflation in and recognize that a significant amount already is expended, and we've gotten a great deal of return on that large R&D investment, and that that return is

⁴¹ HQ SAC Background paper dated 18 Jan 1990, pg., 4.

⁴² Robert S. Dudley, "The B-2 Is Still Flying", Air Force Magazine, September, 1989, pg., 23

embodied not only in this special system, then all these factors will help the members begin to understand the cost numbers, in a better context, to make these figures less scary than they seemed."⁴³ The authors acknowledge that fiscal constraints mandate that all programs come under careful scrutiny. However, stealth technology has been proven--the Panama invasion is testament to the ability of a low observable aircraft to strike its target without being detected by enemy radar. The flexibility of nuclear and conventional capability and the unequaled force projection of the B-2 will provide the U.S. with a deterrent capability that must be pursued.

It is easy to understand why Perestroika and Glasnost may have lulled some Americans into believing there is no longer a soviet threat. But despite the rhetoric, the Soviets continue to modernize their armed forces. While they may be lowering forces levels, the equipment they are reducing are those systems that are old and obsolete. This equipment is being replaced by modern systems which results in a net reduction, but at the same time, results in a quantum leap in terms of quality and combat power.

In the authors view, the real question concerning the B-2 should not be "can we afford it?" Rather, Americans should ask themselves "can we afford not to!" In other

⁴³ Ibid., pg., 24.

words, how much are Americans willing to spend in order to guarantee our national values and our way of life?

In short, we concur with Mr Donald Fink, the B-2 "is a master piece the U.S. cannot afford not to produce."⁴⁴

⁴⁴Donald E. Fink, Aviation Week & Space Technology, July 24, 1989, pg., 13.